



Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE BRYOLOGIST.

VOL. VII.

MARCH, 1904.

No. 2.

FURTHER NOTES ON CLADONIAS.

Cladonia fimbriata.

BRUCE FINK.

It is the intention in the present paper to follow out, with reference to a single species, the work begun in a previous number of the BRYOLOGIST, (6:2.1903). With all due respect to the labors of the noted American lichenist, Tuckerman, it must be apparent to all who have attempted to use his diagnoses of American *Cladonias* as aids in determination, that they are too brief and indefinite. Tuckerman recognizes in his manual just two varieties of *Cladonia fimbriata*, disposes of the species in a half page, and gives not the slightest hint that the forms are extremely varied and difficult to determine. This view is all that could be expected from one who was a pioneer in the study of American lichens, and much as Tuckerman has done for American lichenology, we can not afford to do otherwise than pass beyond his results as rapidly as may be with some adequate degree of certainty.

In passing beyond the Tuckermanian view, we have been so fortunate as to have the aid of Dr. E. Wainio, and we now have his view of more than two hundred specimens of American *Cladonias*, which the writer has sent to him from time to time. Attention was directed to the extremely great amount of variation in forms of *Cladonia fimbriata* years ago in work in the field, and an especial effort was made to obtain all of the forms possible. But it was only by a careful study of the species, as viewed by Dr. Wainio, and set forth in great detail in one hundred and three pages of his monograph of the genus *Cladonia*, that the present writer began to realize something of the difficulties to be encountered in the attempt to gain anything like an adequate knowledge of the species. In Wainio's monograph, sixteen varieties and a very large number of subvarieties and forms are recognized. We have not been able to see the subvarietal distinctions in some instances even with specimens which have passed through Dr. Wainio's hands before us, and so it is not deemed wise to burden these pages with them. However, though we may not be able to follow the specialist in the genus into all of the intricacies of the most minute and discriminating observations, we can at least improve matters somewhat, and perhaps as much as is desirable, by attempting somewhat brief and yet sufficiently definite descriptions of the twelve varieties which are well known to exist in North America.

By giving figures of our more common forms with the descriptions, it is hoped that the student of lichens will not confuse the varieties and assign them to other species so frequently as has been done in the past. The figures are not in this instance all from plants examined by Dr. Wainio, two or three of them having been selected from other specimens which seem to

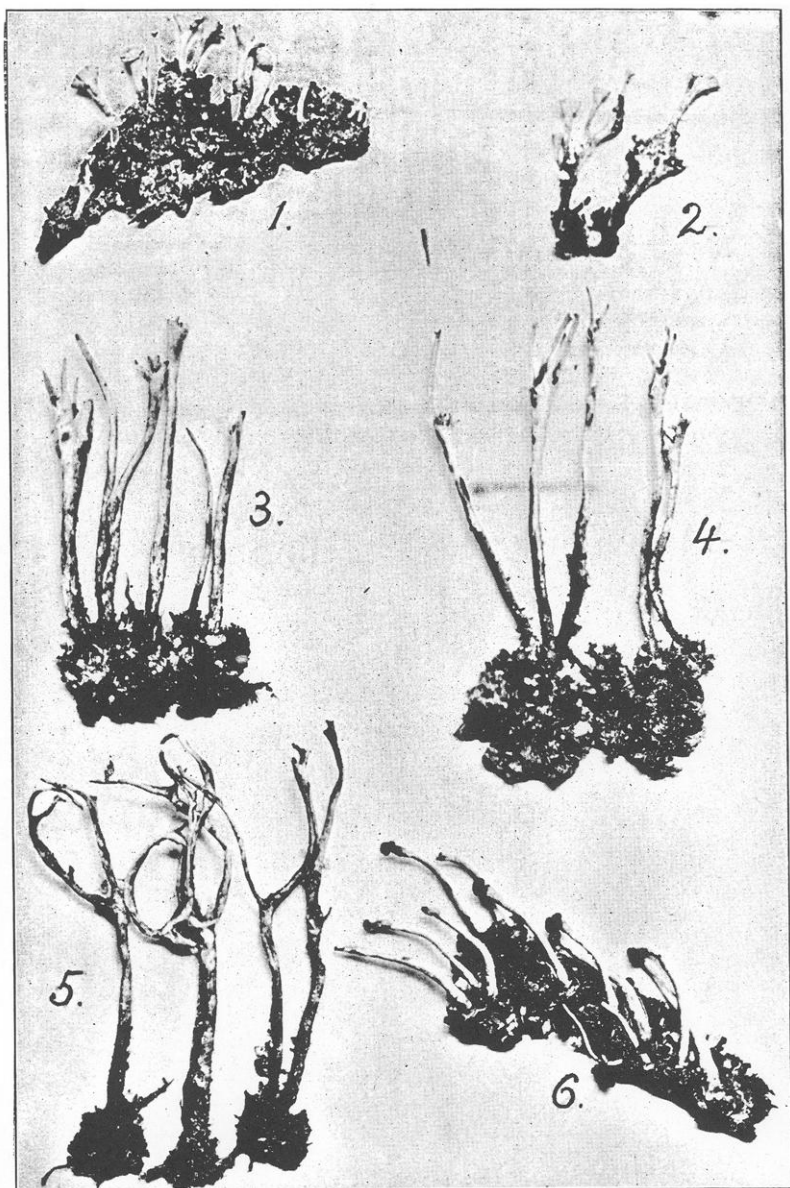


PLATE III. Fig. 1. *Cladonia fimbriata* var. *simplex*. Fig. 2. Var. *proli-
fera*. Fig. 3. Var. *cornutoradiata*. Fig. 4. Var. *radiata*. Fig. 5.
Var. *subulata*. Fig. 6. Var. *coniocraea*. Enlarged $\frac{1}{3}$.

bring out the varietal characters better. Some of the figures are from European plants, these having been selected because better specimens from which to secure the photographs.

Concerning some of the twelve varieties recorded below, they are either rare in North America or little is known of their distribution. A large amount of material in various herbaria the writer has not been able to see, and some of this would no doubt throw much light on the matter of distribution, especially that of Tuckerman's collection in New England. Passing to descriptions, the general description of the species will be given first, followed by shorter diagnoses of the varieties and such statements regarding distribution as can be made in the present state of knowledge of the species.

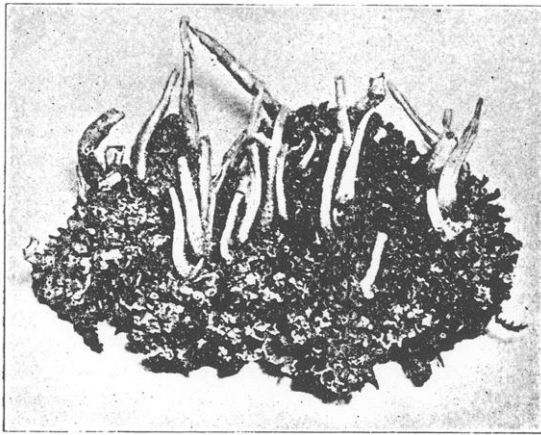


Fig. 7. *Cladonia fimbriata* $\times 2$.

CLADONIA FIMBRIATA (L.) Fr. Lich. Eur. Ref. 222. 1831. Fig. 7.

Primary thallus commonly persistent, composed of digitately or irregularly incised or lobate, flat or concave, frequently involute or convolute, ascending, clustered or scattered, medium sized squamules, which are 2-9 mm. long and nearly or quite as wide, sea-green above or varying toward olivaceous or whitish, below whitish or darkening toward the base and the whole lower surface and edges sometimes sorediate-granulate. Podetia arising from the surface of the squamules, 4-100 mm. long and .5-3.5 mm. in diameter, cylindrical to tubaeform or rarely turbinate, the sides rarely rimose, commonly occurring in larger or smaller clusters, erect or rarely ascending or irregularly curved, commonly decorticate and more or less sorediate, or areolate or verrucose-corticate toward the base, or the basal corticate portions even subcontinuous, destitute of squamules or more or less squamulose, especially toward the base, sea-green varying toward whitish or brownish, the decorticate portions commonly whitish, sometimes cup-

shaped, or the apices frequently cornute or subulate. Cups well developed or abortive, abruptly or gradually dilated, regular or irregular, the cavity commonly deep and non-perforate, the margin entire, dentate or proliferate, the proliferations one to several and the ranks one to three. Apothecia rather rare and medium sized, .8-2 mm. in diameter, solitary and rounded or irregularly conglomerate, sessile or pedicellate on the margins of the cups or at the cornute or subulate apices, flat and immarginate or more commonly becoming convex and immarginate, brown or rarely reddish-brown. Hypothecium pale or cloudy. Hymenium pale or pale-brownish below and brownish above. Paraphyses rarely branched, commonly thickened and brownish toward the apex. Asci clavate or cylindrico-clavate.

Generally distributed over North America and throughout the world in one form or another, the varieties being connected by various intermediate forms and altogether constituting perhaps the most confusing assemblage of lichens known to our flora.

CLADONIA FIMBRIATA (L.) Fr. var. *SIMPLEX* (Weis.) Wainio Mon. Clad. Univ. 2:356. 1894. Plate III. Fig. 1.

Podetia erect and straight, scarcely exceeding 3-30 mm. in length, scyphiform (i. e. cup-like), the cups well developed, 2-7 mm. in diameter, regular or becoming suboblique, with entire or dentate margin. Apothecia rare, sessile or pedicellate on the margins of the cups. Confusingly like forms of *Cladonia pyxidata*, but may usually be distinguished by the more slender habit, the more sorediate-granulate condition and transitional states passing into strictly cylindrical forms of the present species.

Found on various moist and somewhat shaded soils and more commonly on decaying wood. Examined by the writer from Newfoundland, Ontario, Minnesota, Iowa, Florida, Colorado and Idaho. Cited by Wainio from such widely separate localities as Great Bear Lake and New Mexico and California. These localities give the variety a general North American distribution. Known also in all of the grand divisions.

CLADONIA FIMBRIATA (L.) Fr. var. *PROLIFERA* (Retz.) Wainio Mon. Clad. Univ. 2:270. 1894. Plate III. Fig. 2.

Podetia 20-70 mm. long, scyphiform, repeatedly proliferate from well developed cups, commonly straight and erect, wholly decorticate and for most part sorediate, or having a minutely areolate or verrucose cortex below, sometimes squamulose especially toward the base. Cups 2-10 mm. in diameter, commonly somewhat abruptly dilated, regular or oblique, proliferations one or more from each cup and the ranks two or three or rarely more, the upper ranks usually quite as long as the lower and scyphiform, but the terminal cups commonly narrowed. Apothecia rare and usually borne on the cups of the highest rank. Readily distinguished from the last by the proliferous habit.

Occurring on damp earth and more rarely on mossy rocks and decaying trunks of trees. Seen by the writer from Newfoundland and from northern Minnesota. Also cited by Wainio from Vancouver Island. Supposed to be

widely distributed in Europe, but Wainio gives only five stations. Known also in South America and Asia, but hardly a common lichen in any country as yet.

CLADONIA FIMBRIATA (L.) Fr. var. *CORNUTORADIATA* Coem. Clad. Ach. 40. 1865. Plate III. Fig. 3.

Podetia elongated (ours and European material seen 30-50 mm. long), sometimes bearing narrowed or abortive cups, simple or branched and the branches cornute or scyphiform, destitute of squamules or squamulose toward the base, decorticate and sorediate, or corticate toward the base and rarely also below the cups, the cavity of the cups also sorediate.

The specimens collected by the writer at Kettle Falls and at Tower, both in northern Minnesota, grew on earth, and the same is true of the only European specimen seen by the writer. Not likely to occur on decaying wood. Not known elsewhere in North America, and in foreign countries only in Europe. Known to us through the kindness of Dr. Wainio, who determined one of the collections from Minnesota.

CLADONIA FIMBRIATA (L.) Fr. var. *RADIATA* (Schreb.) Wainio Mon. Clad. Univ. 2:277. 1894. Plate III. Fig. 4.

Podetia commonly elongated, 17-75 mm. in length, scyphiform, elongate-turbinate or subtubaeform, frequently more than one-ranked and the sterile apices cornute, subulate or rarely obsoletely scyphiform, commonly straight and suberect, wholly decorticate and sorediate, or corticate and minutely areolate or verrucose toward the base, without squamules or rarely squamulose, especially toward the base. Cups rather small, 2-5 mm. in diameter, gradually or quite abruptly dilated, regular or irregular, the margins dentate to proliferate, the proliferations one to several and elongated or quite short, often two or three ranked. Apothecia rare, sessile or rarely short pedicellate on the margins of the cups.

Usually occurring on earth or mossy rocks, but once collected by the writer on rotten wood. Examined from Minnesota and Newfoundland. Credited by Wainio from Kotzebue's Sound, from Canada, from the White Mountains and from California. These widely separate localities would seem to give the variety a wide distribution throughout the northern portion of the United States and in British America. Known in all of the grand divisions except South America.

CLADONIA FIMBRIATA (L.) Fr. var. *SUBULATA* (L.) Wainio Mon. Clad. Univ. 2:282. 1894. Plate III. Fig. 5.

Podetia much elongated, 30-100 mm. in length, almost always cupless, cylindrical, simple or variously branched, the sterile apices obtusely cornute or subulate, erect and straight, or flexuous especially toward the apex, wholly decorticate and sorediate, or areolate or subcontinuously corticate toward the base, without squamules or more or less squamulose, especially toward the base. Apothecia rare, at the apices of the podetia.

The plant occurs on earth, especially over rocks on thin soil. Said to occur rarely on rotting wood. The American material examined by the

writer is all from the northern half of Minnesota, where the plant is quite frequently seen. Wainio cites the variety from Vancouver Island and from the White Mountains. Probably not infrequent from Minnesota eastward about the Great Lakes into the mountains of New England and northward in British America. Known in all of the grand divisions.

CLADONIA FIMBRIATA (L.) Fr. var. NEMOXYNA (Ach.) Wainio Mon. Clad. Univ. 2:295. 1894.

Podetia commonly 25-90 mm. long, scyphiform or subscyphiform, two or three ranked, the sterile apices abortively scyphiform, cornute or subulate, suberect or more or less flexuous, wholly decorticate and sorediate, or the basal half (more or less) variously areolate or verrucose corticate as also at the base of the apothecia and the proliferations, without squamules, or squamulose toward the base and below the cups, or the whole podetium very rarely and sparsely squamulose. Cups small or abortive, 1-3.5 mm. in diameter, gradually or somewhat abruptly dilated, commonly becoming irregular, the margin dentate or proliferate, the proliferations one or more and short or quite elongated. Apothecia rare, and sessile or on pedicels on the margins of the cups. Dr. Wainio would refer all of our material to the subvariety, *fibula* (Ach.) Wainio Mon. Clad. Univ. 2:300. 1894. In this the podetia are commonly simple and scarcely ever exceed 50 mm. in length, and the cups are more regular and scarcely ever proliferate.

On shaded earth, especially on thin soil over rocks in woods. Known to the writer only through his specimens from the northern half of Minnesota, where the variety is rather rare. Cited from New Bedford, Massachusetts, by Wainio. Apparently not a common variety anywhere, but still recorded from all of the grand divisions.

CLADONIA FIMBRIATA (L.) Fr. var. CONIOCRAEA (Flk.) Wainio Mon. Clad. Univ. 2:308. 1894. Plate III. Fig. 6.

Podetia rather short, commonly 5-25 mm. long and 1-2 mm. diameter, cupless and cylindrical or abortively scyphiform, simple or rarely and sparsely short-branched toward the apex, the sterile apices subulate, cornute or abortively scyphiform, commonly straight and erect, but some, times flexuous, wholly decorticate and sorediate, or corticate toward the base and rarely below the cups; the cortex subcontinuous or areolate-verrucose, without squamules or more or less squamulose, especially toward the base. Cups rare and small or abortive, 1-2 mm. in diameter, terminal with an entire or at least non-proliferous margin. Apothecia rather rare, at the apex of the podetia or on the margin of the cups, subsolitary and on very short pedicels.

Commonly on old and rotting wood or among mosses over rocks. The writer finds the plant generally distributed over Minnesota and Iowa, and has examined it from Newfoundland, New England, Ohio, Illinois and Colorado. Some material from California also seems quite as much at home here as in the next. This and the next include a large part of *C. fimbriata* var. *tubaeformis* of Tuckerman's manual, and no doubt both of the varieties

occur to the south also and have a very general North American distribution. Known also in Europe, Asia and Australia.

CLADONIA FIMBRIATA (L.) Fr. var. *APOLEPTA* (Ach.) Wainio Mon. Clad. Univ. 2:307. 1894.

Podetia commonly quite short, cupless or narrowly or abortively scyphiform, wholly decorticate and sorediate, or corticate toward the base and rarely below the apothecia, which are rare and brown, brick-colored, or pale. The podetia rather shorter and more slender than the last, lighter in color and more frequently squamulose.

The last sentence above is based on six or seven specimens examined by Dr. Wainio, mostly from Minnesota. The habitat is as that of the last, and the writer freely admits that he can not distinguish between the two from any description at hand and only in the best marked specimens. It may well be doubted whether the two should be separated, and this view is strengthened by a perusal of Dr. Wainio's descriptions. Material which seems nearer the present form has been examined from Minnesota, Iowa, New England, Ohio, Illinois and California, and the North American and foreign distribution is doubtless about the same as that of the last.

CLADONIA FIMBRIATA (L.) Fr. var. *OCHROCHLORA* (Flk.) Wainio Mon. Clad. Univ. 2:319. 1894.

Podetia commonly rather short, about 5-40 mm. in length, cylindrical or tubaeform, cupless or scyphiform, rarely more or less rimose, sometimes more or less flexuous, frequently more or less squamulose, partly decorticate and sorediate and in part corticate, especially toward the base and below the apothecia, or some of the podetia wholly decorticate, the sterile apices cornute or subulate. Cups abortive or rarely well developed and dentate or proliferate, the proliferations sometimes numerous, ranks one to three, the lower longer; cavity of cups commonly sorediate. Apothecia rather rare, and of medium size, about .7-4 mm. in diameter, solitary or more less conglomerate at the ends of the podetia or sessile on the margin of the cups, brown, brick-colored or pale.

The plant occurs on old wood and among mosses over rocks, especially in more or less shaded places. Dr. F. Arnold listed this variety from several localities in Newfoundland, and Dr. Wainio credits it from Massachusetts, Washington and California. American specimens have not been seen by the writer. Known in all of the grand divisions.

CLADONIA FIMBRIATA (L.) Fr. var. *BALFOURII* (Crómb.) Wainio Mon. Clad. Univ. 2:339. 1894.

Podetia about 5-25 mm. long and .5-1.5 mm. in diameter, cupless and cylindrical, simple or rarely and sparsely branched toward the apex, erect or suberect, straight or rarely subflexuous, wholly decorticate or rarely corticate or subcorticate toward the base, the decorticate portions most commonly minutely and densely sorediate, without squamules or rarely more or less squamulose toward the base, more or less dull-waxy in appearance, especially when damp, the sterile apices narrowly subulate or obtusely cornute. Apothecia brownish or rarely pale.

Occurring on earth, among mosses over rocks or rarely on rotting wood. Cited from the White Mountains and Nicaragua by Wainio, but the writer knows the variety only through a specimen sent by Dr. Wainio and collected in Brazil. Known also in Africa and Australia.

CLADONIA FIMBRIATA (L.) Fr. var. *BORBONICA* (Del.) Wainio Mon. Clad. Univ.

2:343. 1894.

Podetia about 5–30 mm. long and .5–1.5 mm. in diameter, subcylindrical, cupless or narrowly scyphiform, simple or rarely and sparsely branched, straight or flexuous, commonly sterile, wholly decorticate or more or less corticate toward the base, where the corticate areas are then subcontinuous, verrucose or areolate, thickly squamulose especially toward the base, and the squamules lacerate and more or less sorediate, the podetia also similarly sorediate especially toward the apex, or the soredia disappearing, the corticate portions sometimes more or less waxy, the apices subulate or obtusely cornute. Cups about .8–2 mm. wide, sometimes abruptly dilated, subregular, margin entire or rarely dentate or proliferous. Apothecia dusky-brown.

Occurring on old trunks in more or less sunny places and on the naked sides of mountains. Cited from Mexico by Wainio, but the writer has not seen the plant. Also from South America, Australia, southern Asia and Africa.

CLADONIA FIMBRIATA (L.) Fr. var. *CHLOROPHAEOIDES* Wainio Mon. Clad. Univ.

2:336. 1894.

Podetia about 5–50 mm. in length and .5–3 mm. in diameter, tubaeform or rarely subturbinata, scyphiform, suberect and usually straight, wholly decorticate and minutely and densely sorediate, or the soredia finally disappearing wholly or in part, without squamules or minutely isidioid-squamulose toward the base, or even bearing larger squamules here, more or less distinctly waxy in appearance. Cups well developed, about 1–12 mm. in diameter, somewhat abruptly or rarely more gradually dilated, commonly regular, margin entire or rarely dentate, the cavity decorticate and sorediate. Apothecia borne on the margin of the cups, on pedicels which are 1–8 mm. long, solitary or radiately arranged, brown, varying toward reddish or yellowish.

Occurring on earth, rocks or rotting trunks of trees. Reported from Mexico and Nicaragua by Dr. Wainio. Not known to the writer. Also found in South America, Africa and Australia. Thus this variety and the last above seem to be southern forms, not likely to occur in North America, except in the most southern portions.

Aside from the collections of the writer, mainly in Iowa and Minnesota, the material which he has examined, or cited on authority of Dr. Wainio, was collected for the most part by W. G. Farlow, H. Willey and Clara E. Cummings in New England; A. C. Waghorne, in Newfoundland; J. Macoun, in Canada; C. F. Baker, in Colorado; A. A. Heller, in Idaho; E. E. Bogue, in Ohio; H. E. Hasse, in California, and G. P. Clinton, in Illinois. The plants photographed from Europe were collected by L. Scriba, of Höchst in Germany, whose plants are among the best that come to us and are largely determined or examined by Dr. Wainio. Grinnell, Iowa.